

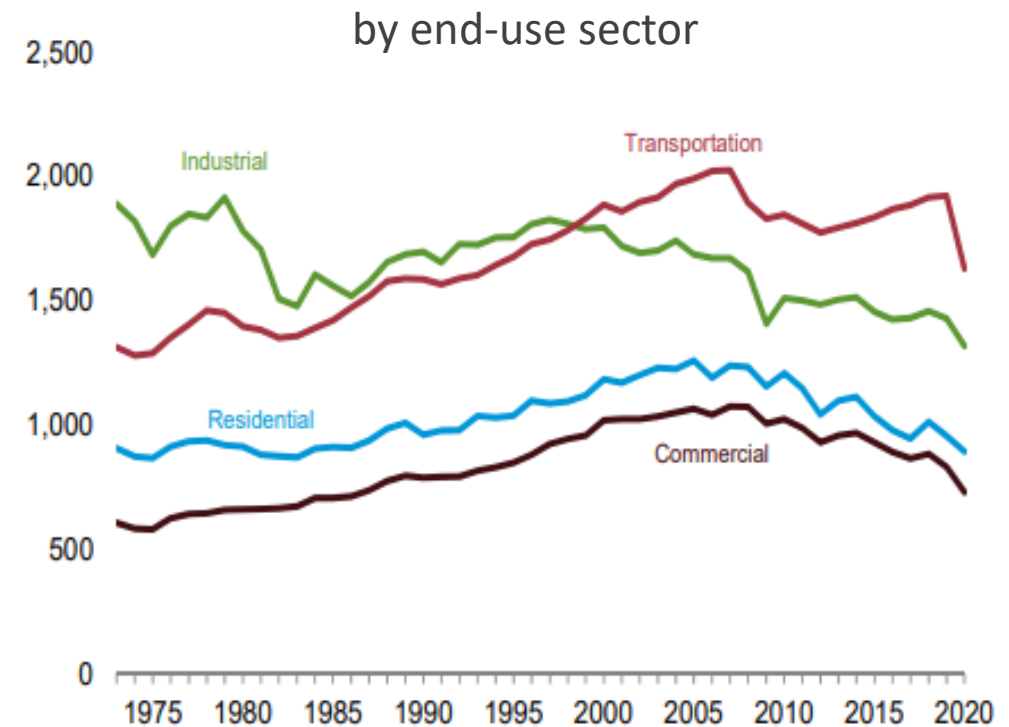
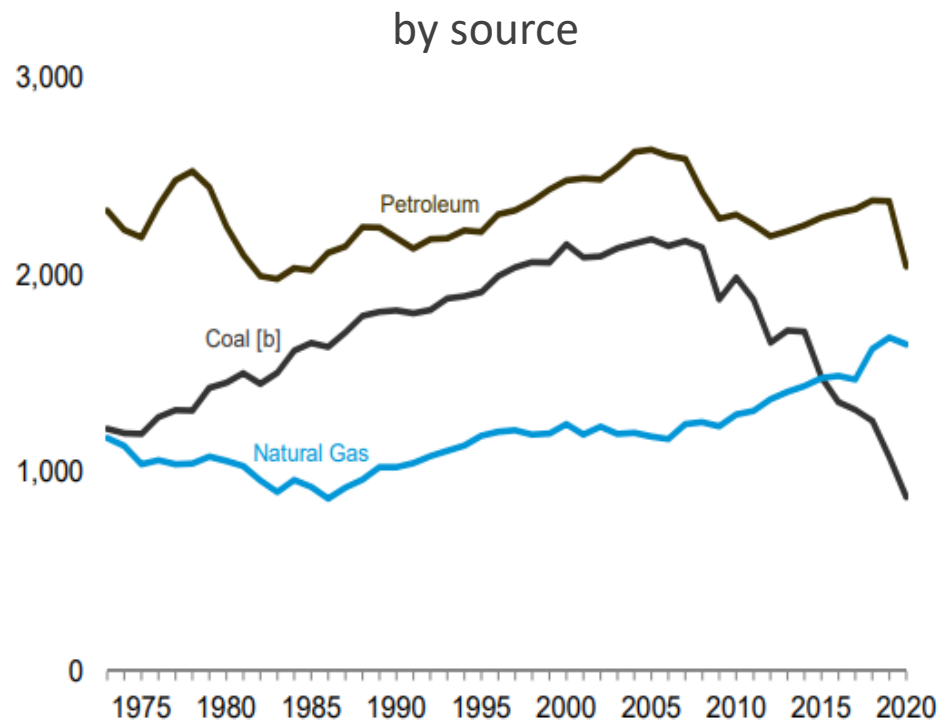
The background of the slide features a large, dark silhouette of a high-voltage power transmission tower on the left side. Several power lines extend from the tower across the frame. In the background, a city is visible at night, with numerous lights from buildings and streets glowing against the dark landscape. The sky is a mix of soft orange and blue hues, suggesting a sunset or sunrise. A light blue rectangular box with a vertical blue bar on its left edge is positioned on the right side of the slide, containing the title and presenter information.

# Valuation of Energy Storage for Manufacturing and Industrial Decarbonization

Erin Childs | February 2022

# Industrial sector emissions remain an important piece of economy wide decarbonization

U.S. Energy-Related Carbon Dioxide Emissions  
(million metric tons)



**We need to decarbonize industrial processes if we want to achieve our carbon reduction goals!**

Source: [https://www.eia.gov/totalenergy/data/monthly/pdf/sec11\\_4.pdf](https://www.eia.gov/totalenergy/data/monthly/pdf/sec11_4.pdf); [https://www.eia.gov/totalenergy/data/monthly/pdf/sec11\\_2.pdf](https://www.eia.gov/totalenergy/data/monthly/pdf/sec11_2.pdf)

# A diversity of tools is important to help different ecosystem stakeholders make smart and informed investment decisions

## Example 1: Use of GREET Model for measuring emission reductions

- + **Measures societal costs and benefits from global climate pollutants**
- + **Assesses lifecycle emissions**
- + **Can be used for state or federal policymaking and macro-scale investment decisions**

## Example 2: Use of levelized cost of hydrogen for opportunity assessment

- + **Measures delivered cost of hydrogen based on production, transport, and storage costs**
- + **Can be used to compare against incumbent fossil-based fuel sources**
- + **Can be used to inform business decisions and investments for an individual developer**

**Different questions and problems will need different analytical tools!**



# Case Study: Opportunities for electrolytic hydrogen to reduce emissions in hard-to-abate industrial applications

## Refinery Applications



### Germany - Heide Oil Refinery 700 MW by 2030

- + Green hydrogen can replace grey hydrogen in refinery processes, and is often benefited by co-location

## Port Decarbonization



### Belgium - Hyport Oostende 50 MW by 2025

- + Green hydrogen and H2 synthetic fuels can power long haul shipping, harbor craft, and on-land transport craft including forklifts

## High Heat Applications



### Spain – Sestao Plant 2.3M tons by 2025

- + Green hydrogen can replace natural gas and coal currently used for high heat applications including steel refining



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